In the Claims

Please replace all prior versions, and listings, of claims in the application with the following list of claims:

1. (Original) A method for identifying an individual unit of a polymer comprising

transiently moving the individual unit of the polymer relative to a station, the identity of the individual unit being unknown,

detecting a signal arising from a detectable physical change in the unit or the station, and.

distinguishing said signal from signals arising from exposure of adjacent signal generating units of the polymer to the station as an indication of the identity of the individual unit.

2. (Original) The method of claim 1, wherein the station is an interaction station and wherein individual units are exposed at the interaction station to an agent that interacts with the individual unit to produce a detectable electromagnetic radiation signal characteristic of said interaction.

3-22. (Cancelled)

23. (Original and Withdrawn) An article of manufacture, comprising:

a wall material having a surface defining a channel,

an agent wherein the agent is selected from the group consisting of an electromagnetic radiation source, a quenching source, a luminescent film layer and a fluorescence excitation source, attached to the wall material adjacent to the channel, wherein the agent is close enough to the channel and is present in an amount sufficient to detectably interact with a partner compound selected from the group consisting of a light emissive compound, a light accepting compound, radiative compound, and a quencher passing through the channel.

24. (Original and Withdrawn) The article of claim 23, wherein the agent is an electromagnetic radiation source and wherein the electromagnetic radiation source is a light emissive compound.

25. (Original and Withdrawn) The article of claim 24, wherein the channel is a microchannel.

26. (Original and Withdrawn) The article of claim 24, wherein the channel is a nanochannel.

27. (Original and Withdrawn) The article of claim 24, wherein the surface of the wall material defining the microchannel is free of the light emissive compound.

28. (Original and Withdrawn) The article of claim 24, wherein the light emissive compound is attached to an external surface of the wall material.

29. (Original and Withdrawn) The article of claim 28, wherein the light emissive compound is attached to a linker which is attached to the external surface of the wall material.

30. (Original and Withdrawn) The article of claim 28, wherein the light emissive compound is concentrated at a region of the external surface of the wall material that surrounds a portion of the channel.

31. (Original and Withdrawn) The article of claim 28, further comprising a masking layer having openings which allow exposure of only localized areas of the light emissive compound.

32. (Original and Withdrawn) The article of claim 24, further comprising a second light emissive compound different from the first attached to the wall material adjacent to the channel, wherein the light emissive compound is close enough to the channel and is present in an amount effective to detectably interact with a partner light emissive compound passing through the channel.

33. (Original and Withdrawn) The article of claim 28, wherein the external surface of the wall material adjacent to the light emissive compound is a conducting layer.

34. (Original and Withdrawn) The article of claim 33, wherein the wall material comprises two layers, the conducting layer and a nonconducting layer.

35. (Original and Withdrawn) The article of claim 28, wherein the wall material comprises at least two layers, a first layer preventing signal generation and a second layer allowing signal generation.

36. (Original and Withdrawn) The article of claim 28, wherein the external surface of the wall material adjacent to the light emissive compound is a light impermeable layer.

37. (Original and Withdrawn) The article of claim 35, wherein the wall material comprises two layers, the light impermeable layer and a support light permeable layer.

38. (Original and Withdrawn) The article of claim 24, wherein the light emissive compound is embedded in the wall material.

39. (Original and Withdrawn) The article of claim 38, wherein the light emissive compound is concentrated at a region of the wall material that surrounds a portion of the channel.

40. (Original and Withdrawn) The article of claim 39, wherein the light emissive compound forms a concentric ring in the wall material around a portion of the channel.

41. (Original and Withdrawn) The article of claim 38, further comprising a second light emissive compound different from the first attached to the wall material adjacent to the channel, wherein the light emissive compound is close enough to the channel and is present in an amount effective to detectably interact with a partner light emissive compound passing through the channel.

42. (Original and Withdrawn) The article of claim 41, wherein the second light emissive compound is embedded in the wall material.

43. (Original and Withdrawn) The article of claim 38, wherein the wall material comprises a first conducting layer adjacent to a first side of the light emissive compound.

44. (Original and Withdrawn) The article of claim 43, wherein the wall material comprises a second conducting layer adjacent to a second side of the light emissive compound, the first and second layers sandwiching the light emissive compound.

45. (Original and Withdrawn) The article of claim 38, wherein the wall material comprises a nonconducting material and wherein the light emissive compound is embedded in the nonconducting material.

46. (Original and Withdrawn) The article of claim 38, wherein the wall material comprises a first light impermeable layer on a first side of the light emissive compound.

47. (Original and Withdrawn) The article of claim 46, wherein the wall material comprises a second light impermeable layer on a second side of the light emissive compound, the first and second layers sandwiching the light emissive compound.

48. (Original and Withdrawn) The article of claim 38, wherein the wall material is a light permeable material.

49. (Original and Withdrawn) The article of claim 48, wherein the light emissive compound is embedded in the light permeable material.

50. (Original and Withdrawn) The article of claim 24, wherein the light emissive compound is embedded in a layer of a light permeable material.

51. (Original and Withdrawn) The article of claim 44, wherein the light emissive compound is embedded in a layer of a light permeable material.

52. (Original and Withdrawn) The article of claim 23, wherein the light emissive compound is a fluorescent compound.

53. (Original and Withdrawn) The article of claim 24, wherein a length of the nanochannel is between 500 Angstroms and 1 mm.

54. (Original and Withdrawn) The article of claim 23, wherein a width of the channel is between 1 and 500 Angstroms.

55. (Original and Withdrawn) The article of claim 23, wherein the wall material is formed of two layers, a first light impermeable layer and a luminescent film layer attached to one another, wherein the channel extends through both layers and is defined by surfaces of both layers.

56. (Original and Withdrawn) The article of claim 55, wherein the channel is a nanochannel.

57. (Original and Withdrawn) The article of claim 56, further comprising a second light impermeable layer, the luminescent film layer positioned between the first and second light impermeable layers.

58. (Original and Withdrawn) The article of claim 55, wherein the surface defining the channel includes a surface of the light impermeable layer which is free of luminescent film layer material.

59. (Original and Withdrawn) The article of claim 55, wherein the length of the channel is between 500 Angstroms and 1 mm.

60. (Original and Withdrawn) The article of claim 23, wherein the agent is a fluorescence excitation source and wherein the fluorescence excitation source is a scintillation layer.

61. (Original and Withdrawn) The article of claim 60, wherein the scintillation layer is selected from the group consisting of NaI(TI), ZnS(Ag), anthracene, stilbene, and plastic phosphors.

62. (Original and Withdrawn) The article of claim 60, wherein the scintillation layer is embedded in the wall material between two radiation impermeable layers.

63. (Original and Withdrawn) An article of manufacture, comprising:

a wall material having a surface defining a plurality of channels,

a station attached to a discrete region of the wall material adjacent to at least one of the channels, wherein the station is close enough to the channel and is present in an amount sufficient to cause a signal to arise from a detectable physical change in a polymer of linked units passing through the channel or in the station as the polymer is exposed to the station.

64. (Original and Withdrawn) The article of claim 63, wherein the station is an interaction station and wherein the interaction station is an electromagnetic radiation source.

65. (Original and Withdrawn) The article of claim 63, wherein the wall material is formed of two layers, a first light impermeable layer and a luminescent film layer attached to one another, wherein the channel extends through both layers and is defined by surfaces of both layers.

66. (Original and Withdrawn) The article of claim 63, wherein the station is a signal generation station and wherein the signal generation station produces a polymer dependent impulse.

67. (Original and Withdrawn) The article of claim 63, wherein the station is an electromagnetic radiation source and

wherein the electromagnetic radiation source is a scintillation film.

68. (Original and Withdrawn) The article of claim 67, wherein the scintillation film is embedded in the wall material between two radiation impermeable layers.

69. (Original and Withdrawn) The article of claim 64, wherein the channel is a microchannel.

70. (Original and Withdrawn) The article of claim 64, wherein the channel is a nanochannel.

71. (Original and Withdrawn) An article of manufacture, comprising:

a wall material having a surface defining a channel,

a plurality of stations each attached to a discrete region of the wall material adjacent to the channel, wherein the stations are close enough to the channel and are present in an amount sufficient to cause a signal to arise from a detectable physical change in a polymer of linked units passing through the channel or in the station as the polymer is exposed to the station.

72. (Original and Withdrawn) The article of claim 71, wherein the stations are interaction stations.

73. (Original and Withdrawn) The article of claims 71, wherein the stations are signal generation stations.

74. (Original and Withdrawn) The article of claim 71, wherein the station is an electromagnetic radiation source and wherein the electromagnetic radiation source is a scintillation film.

75. (Original and Withdrawn) The article of claim 71, wherein the channel is a microchannel.

76. (Original and Withdrawn) The article of claim 71, wherein the channel is a nanochannel.

77-97. (Cancelled)

98. (Original) A method for detecting resonance energy transfer or quenching between two interactive partners capable of such transfer or quenching comprising

bringing the two partners in close enough proximity to permit such transfer or quenching,

applying an agent to one of said partners, the agent selected from the group consisting of electromagnetic radiation, a quenching source and a fluorescence excitation source,

shielding fluorescence resonance energy transfer and quenching occurring from electromagnetic radiation emission and interaction between said partners with a material shield, and

detecting the emitted electromagnetic radiation.

99. (Original and Withdrawn) An apparatus for detecting a signal comprising,

a housing with a buffer chamber

a wall defining a portion of the buffer chamber, and having a plurality of openings for aligning polymers,

a sensor fixed relative to the housing, the sensor distinguishing the signals emitted at each opening from the signals emitted at the other of the openings to generate opening dependent sensor signals, and

a memory for collecting and storing said sensor signals.

100. (Original and Withdrawn) The apparatus of claim 99, wherein the sensor is an optical sensor and the optical sensor senses electromagnetic radiation signals emitted at the plurality of openings.

101. (Original and Withdrawn) The apparatus of claim 99, further comprising a microprocessor.

102. (Original and Withdrawn) The apparatus of claim 99, wherein the openings are defined by microchannels in the wall.

103. (Original and Withdrawn) The apparatus of claim 99, wherein the openings are defined by nanochannels in the wall.

104. (Original and Withdrawn) The apparatus of claim 99, wherein the plurality is at least 50.

105. (Original and Withdrawn) The apparatus of claim 99, wherein the apparatus further comprises a second buffer chamber separated from said first buffer chamber, by said wall, and wherein the buffer chambers are in fluid communications with one another via the openings.

106. (Original and Withdrawn) The apparatus of claim 104, wherein the apparatus further comprises a second buffer chamber separated from said first buffer chamber, by said wall, and wherein the buffer chambers are in fluid communications with one another via the openings.

107. (Original and Withdrawn) The apparatus of claim 105 further comprising a pair of electrodes secured to the housing, one of said pair positioned in the first buffer chamber and the other of the pair positioned in the second buffer chamber.

108. (Original and Withdrawn) An apparatus for detecting a signal comprising

a housing defining a first buffer chamber and a second buffer chamber,

a wall supported by the housing and separating the first and second buffer chambers,

a plurality of channels defined by the wall and providing fluid communications between the first and second buffer chambers, and

a sensor for distinguishing and collecting channel dependent signals.

109. (Original and Withdrawn) The apparatus of claim 108, wherein the channels are nanochannels.

110. (Original and Withdrawn) The apparatus of claim 108, wherein the channels are microchannels.

111. (Original and Withdrawn) The apparatus of claim 108, wherein an agent selected from the group consisting of electromagnetic radiation, a quenching source and a fluorescence excitation source is attached to the wall.

112. (Original and Withdrawn) The apparatus of claim 111, wherein the agent is electromagnetic radiation and wherein the electromagnetic radiation is a light emissive compound

113. (Original and Withdrawn) The apparatus of claim 112, wherein the light emissive compound is concentrated at the channels in the wall.

114. (Original and Withdrawn) The apparatus of claim 108 further comprising means for moving biological entities through the channels.

115. (Original) A method for characterizing a test polymer comprising,

obtaining polymer dependent impulses for a plurality of polymers,

comparing the polymer dependent impulses of the plurality of polymers,

determining the relatedness of the polymers based upon similarities between the polymer dependent impulses of the polymers, and

characterizing the test polymer based upon the polymer dependent impulses of related polymers.

116. (Original) The method of claim 115, wherein the plurality of polymers is a homogenous population.

117. (Original) The method of claim 115, wherein the plurality of polymers is a heterogeneous population.

118. (Original) The method of claim 115, wherein the polymer is randomly labeled.

119. (Original) The method of claim 115, wherein the polymer is a polymer of at least two different linked units, and wherein said at least two different linked units are labeled to produce different signals.

120. (Original) The method of claim 115, wherein the polymer is a nucleic acid.

121. (Original) The method of claim 120, wherein the obtained polymer dependent impulses include an order of polymer dependent impulses.

122. (Original) The method of claim 120, wherein the obtained polymer dependent impulses includes the time of separation between specific signals.

123. (Original) The method of claim 120, wherein the polymer dependent impulses are obtained by moving the plurality of polymers lineally past a signal generation station.

124. (Original) The method of claim 120, wherein the obtained polymer dependent impulses include a number of polymer dependent impulses.

125. (Original and Withdrawn) A method for labeling nucleic acids comprising,

contacting a dividing cell with a nucleotide analog,

isolating from the cell nucleic acids that have incorporated the nucleotide analog, and

modifying the nucleic acid with incorporated nucleotide analog by labeling the incorporated nucleotide analog.

126. (Original and Withdrawn) The method of claim 125, wherein the nucleotide analog is a brominated analog.

127. (Original and Withdrawn) The method of claim 125, wherein the dividing cell is contacted with a nucleotide analog by

growth arresting the cell in the cell division cycle,

performing the contacting step, and

allowing the cell to reenter the cell division cycle.

128. (Original and Withdrawn) The method of claim 125, wherein the nucleic acids are isolated after the cells have reentered and completed the cell division cycle and before a second cell division cycle is completed.

129. (Original and Withdrawn) The method of claim 125, wherein the incorporated nucleotide analog is labeled with an agent selected from the group consisting of an electromagnetic radiation source, a quenching source, a fluorescence excitation source, and a radiation source.

130. (Original) A method for determining the order of units of a polymer of linked units comprising:

(1) moving the polymer linearly relative to a station,

(2) measuring a polymer dependent impulse generated as each of two individual units, each giving rise to a characteristic signal, pass by the station,

(3) repeating steps 1 and 2 for a plurality of similar polymers, and

(4) determining the order of at least the two individual units based upon the information obtained from said plurality of similar polymers.

131. (Original) The method of claim 130, wherein the station is a signal generation station.

132. (Original) The method of claim 130, wherein the station is an interaction station.

133. (Original) The method of claim 130, wherein step (2) comprises measuring an electromagnetic radiation signal generated.

134. (Original) The method of claim 130, wherein the plurality of similar polymers is a homogeneous population.

135. (Original) The method of claim 130, wherein the plurality of similar polymers is a heterogenous population.

136. (Original) The method of claims 130, wherein the polymer is a nucleic acid.

137. (Original) A method for analyzing a set of polymers, each polymer of said set being an individual polymer of linked units comprising:

orienting the set of polymers parallel to one another, and

detecting a polymer specific feature of said polymers.

138. (Original) The method of claim 137, wherein the polymers are oriented by applying an electric field to said polymers.

139. (Original) The method of claim 137, wherein the polymer specific feature is an order of linked unity in the polymers.

140. (Original) The method of claim 137, wherein the detecting step is performed simultaneously for said polymers.

141. (Original) The method of claim 137, wherein the detection step comprises measuring electromagnetic radiation signals.

142. (Original) The method of claim 137, wherein the detection step comprises causing the polymers to pass linearly relative to a plurality of signal generation stations, and detecting and distinguishing signals generated as said polymers pass said interaction stations.

143. (Original) The method of claim 137, wherein the polymers are a homogenous population.

144. (Original) The method of claim 137, wherein the polymers are a heterogenous population.

145. (Original) The method of claim 137, wherein the polymers are randomly labeled.

146. (Original) The method of claim 137, wherein the orientation step is in a solution free of gel.

147. (Original) A method for analyzing a set of polymers, each polymer of the set being an individual polymer of linked units, comprising:

orienting the set of polymers in an electric field,

simultaneously moving the set of polymers through defined respective channels, and

detecting a polymer specific feature as the polymers are moved through the channels.

148. (Original) The method of claim 147 wherein the channels are nanochannels.

149. (Original) The method of claim 147, wherein the polymer specific feature is an order of linked unity in the polymers.

150. (Original) The method of claim 147, wherein the detecting step is performed simultaneously for said polymers.

151. (Original) The method of claim 147, wherein the detection step comprises measuring electromagnetic radiation signals.

152. (Original) The method of claim 147, wherein the detection step comprises causing the polymers to pass linearly relative to a plurality of signal generation stations, and detecting and distinguishing polymer dependent impulses generated as said polymers pass said signal generation stations.

153. (Original) The method of claim 147, wherein the polymers are a homogenous population.

154. (Original) The method of claim 147, wherein the polymers are a heterogenous population.

155. (Original) The method of claim 147, wherein the polymers are randomly labeled.

156. (Original) The method of claim 147, wherein the orientation step is in a solution free of gel.

157. (Original and Withdrawn) An apparatus for detecting optically a plurality of signals comprising:

a housing with a buffer chamber,

a wall material defining a portion of the buffer chamber, the wall including polymer interaction stations, and

an optical sensor secured to the housing, the optical sensor constructed and arranged to detect electromagnetic radiation signals emitted at the interaction stations.

158-160. (Cancelled)

161. (New) The method of claim 1, wherein the station is a signal generation station and the signal produced is a polymer dependent impulse.